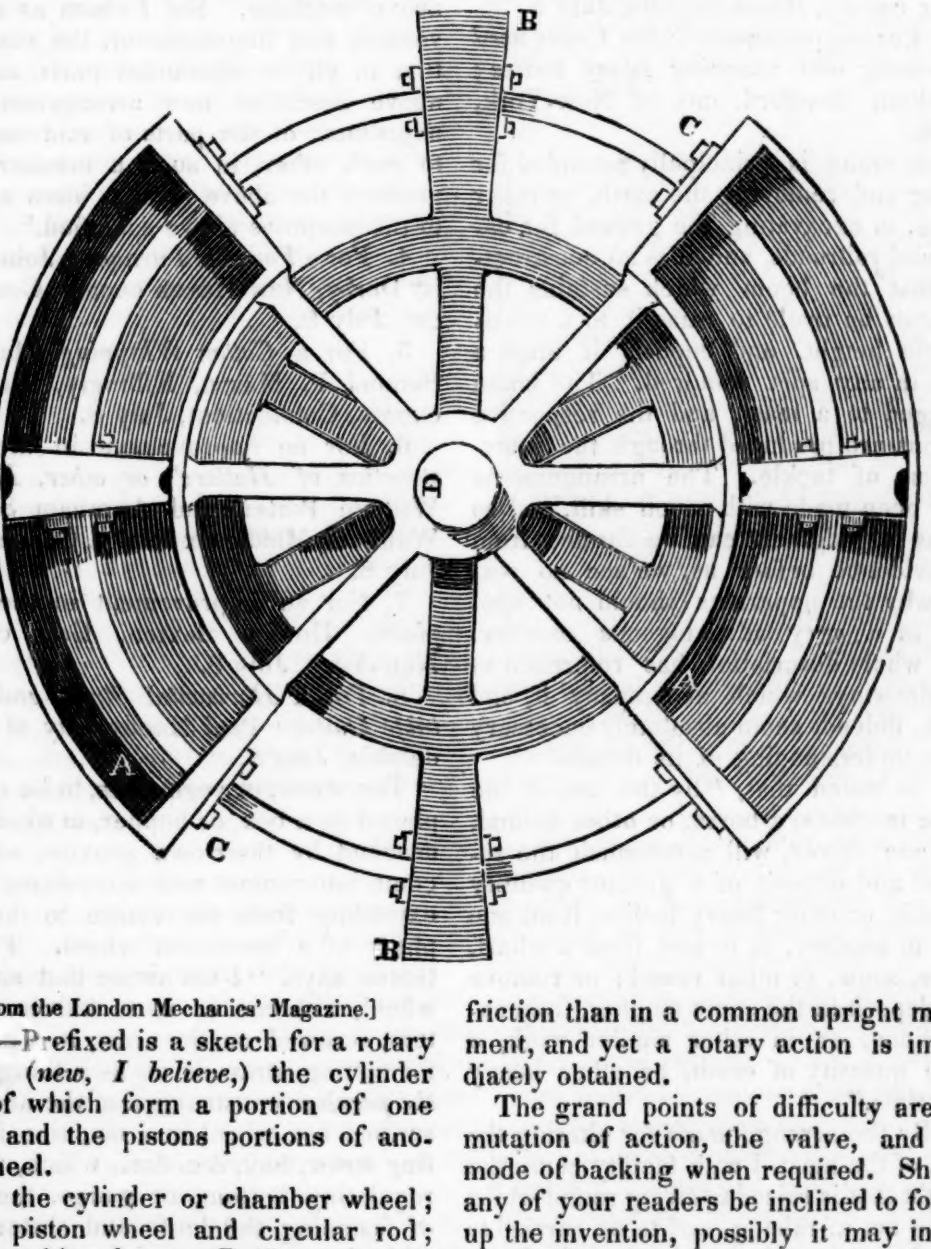
MECHANICS' MAGAZINE,

AND

REGISTER OF INVENTIONS AND IMPROVEMENTS.

VOLUME V.] FOR THE WEEK ENDING MARCH 14, 1835. [NUMBER 3.

STEAM-WHEEL ON A NEW PLAN.



[From the London Mechanics' Magazine.]

SIR,—Prefixed is a sketch for a rotary engine, (*new, I believe,*) the cylinder parts of which form a portion of one wheel, and the pistons portions of another wheel.

A is the cylinder or chamber wheel; B, the piston wheel and circular rod; C, the packing boxes; D, the axis. A working wheel is connected to the axis, D, and the power is communicated thereto by the alternate movement of each wheel. By this plan your readers will perceive that there is not much more friction than in a common upright movement, and yet a rotary action is immediately obtained.

The grand points of difficulty are the mutation of action, the valve, and the mode of backing when required. Should any of your readers be inclined to follow up the invention, possibly it may in the end produce a more ready application of steam power than has hitherto been adopted.

I am, sir, yours respectfully,

JAMES WOODHOUSE.

Kilburn, Aug. 13, 1834.

[From the Journal of the Franklin Institute for Feb.]

List of American Patents which issued in July, 1834, *with Remarks and Exemplifications by the Editor.*

1. For a *Saw for sawing Staves for Barrels, &c.;* Aaron Bard, and Simeon Heywood, Lunenburg, Worcester county, Massachusetts, July 8.

2. For a *Machine for Picking Curled Hair;* John Thompson, 3d, Marblehead, Essex county, Massachusetts, July 8.

3. For improvements in the *Crane used for raising and removing heavy bodies;* Hezekiah Bradford, city of New-York, July 8.

This crane is principally intended for raising and removing the earth, or other bodies, in excavating the ground for canals and railroads, and it is so constructed, that the boom which sustains the load can be made to raise it to a considerable height, and deposit it upon a bank in any spot required. The boom is rigged to a mast, and the respective motions are produced through the intervention of tackle. The arrangements have been made with much skill, and so far as a judgment can be formed from the evidence before us, we see no reason why the apparatus should not operate in a very advantageous manner. The whole description has reference to the drawings which accompany it, and these, indeed, seem absolutely necessary to the understanding of its details.

It is stated that, "by the use of the above machine, a horse, or other animal, and one driver, will accomplish the removal and deposit of a greater quantity of coals, or other heavy bodies, from one spot to another, or to and from a wharf, barge, scow, or other vessel; or remove and deposit in the same manner, from excavations, or in other similar work, a large quantity of earth, or other heavy materials."

"By the arrangements for altering the rake of the mast, I with facility cause the weight that is raised to swing round whilst in the act of raising, and to be carried to the place where it is to be deposited, governing the motion thereof so as to make it more or less rapid, by merely changing the rake of the mast, and the position of the snatch block, so that it shall be further from, or nearer to, the mast. I cause the emptying of the load, or the *dumping,* as it is called by the workmen, to be effected by the same power which raised it, and at the moment at which it arrives at its place of destination."

"I do not claim as my invention, or improvement, the introduction of the use of a crane, or boom, for the purpose of raising and removing heavy bodies; nor do I claim as my invention, or improvement, any of the several parts of the above machine. But I claim as my invention and improvement, the combination in all its substantial parts, and the above described new arrangement and adjustment of the parts of said machine to each other, in such a manner as to produce the above results, when applied to the purposes above specified."

4. For a *Portable Furnace;* John Lewis, Derby, New-Haven county, Connecticut, July 8.

5. For a *Cotton Whipping Machine;* Samuel P. Mason, Killingly, Windham county, Connecticut, July 8.

6. For an improvement in the *Construction of Hatters', or other, Kettles;* William Porter, and Abraham Sanger, Waltham, Middlesex county, Connecticut, July 8.

7. For an improvement in the *Fire-place;* Horace Saxton, Erie county, New-York, July 8.

8. For a *Horizontal Straw and Vegetable Cutter;* Paul Moody, city of Philadelphia, July 8.

The straw, or vegetables, to be cut, are placed in a box, or hopper, in which they descend by their own gravity, so as to come into contact with a revolving blade, extending from the centre to the periphery of a horizontal wheel. The patentee says, "I am aware that simply a wheel, with one or more knives, or cutters, screwed on the arms, in a machine for cutting straw, is no new thing. *But the peculiar* construction of the above described box-wheel in a machine for cutting straw, hay, &c. &c., which, with its regulating bottom, or gauge, the mode of fastening the knife and slitters to it, with the application of the latter in the machine to cut vegetables square, and also the apparatus above described for forcing down and compressing hay, straw, &c. &c., is what I claim as my invention and improvement."

Machines similar in principle have been previously patented and described by us; the claim, therefore, should be only for what are called improvements, the general construction belonging to the original inventor, and not being usable without his consent.

9. For a *Hammer Hatchet;* Joel Howe, Princeton, Worcester county, Massachusetts, July 8.

If to the hammer part of a shingling hatchet, you add a claw projecting back from the hammer face, in a line with the handle, you have this machine.

"The operation of drawing nails is performed by lifting the handle. The hammer drives like other nail hammers. The invention claimed consists in the combination of the hammer claw with the hatchet, and hammer head and face."

10. For a *Plough;* James Jacobs, Maysville, Mason county, Kentucky, July 8.

11. For a *Plough;* James Jacobs, Maysville, Mason county, Ken., July 8. [Denominated the "Smeller Plough."]

12. For a *Filtering Apparatus;* Littleton Ayres, city of Baltimore, July 8.

13. For a *Self-balancing Slide Valve for Steam Engines;* John Kirkpatrick, city of Baltimore, July 10.

14. For an improvement on *Bushing the Sheaves of Pulleys,* and on their pins; Moses H. Marshall, Gloucester, Essex county, Massachusetts, July 10.

15. For a *Traverse Sleigh;* Bela Markham, Burlington, Chittenden county, Vermont, July 10.

17. For an improvement in *Railway Carriages;* Isaac Knight, city of Baltimore. First patented March 18th, 1829; patent surrendered, and re-issued upon an amended specification, July 10.

The same mode of sustaining the lateral thrust of the axle which forms the claim of Mr. Knight, was also claimed in one of the patents obtained by Mr. Ross Winans; which of these gentlemen was "the true and original inventor," is not a question for us to determine.

18. For an improvement in the employment of *Water Power;* Ebenezer Barford, Jay, Oxford county, Maine, July 10.

"The specific, new, and superior facilities comprised in the above described improvement, and which I claim as my own invention, are the following: 1st. The construction of the tub-wheel; its peculiar location, being immersed in a reservoir or cistern of water, and consequently not liable to be encumbered with ice; and the manner of its operation, as comprising the wedge power. 2d. The peculiar manner of using the water, so as to double its action upon the terminating wheel, with its full primary force in each action. 3d. The general arrangement and combination of the parts, without specially regarding their size or proportions, or the material of which they are constructed."

Those persons who are well acquainted with hydraulics, will see enough in the foregoing claims to convince them that the inventor has "travelled out of the record." The idea, which is clearly expressed, that the same water, in the same fall, may be twice used, "with the full primary force in each action," is so manifestly fallacious, as not to require to be disproved; if it can be twice used "with the full primary force," it may be so used a hundred times, and a fall of four feet would be as available as one of four hundred.

In the plan before us, a wheel, with spiral openings near its periphery, through which the water is to descend, is to be placed horizontally in a trunk, or flume; and after it has descended through this, it is to be conducted to an undershot, or flutter, wheel; and the shafts of the two wheels are to be connected by straps, or gearing.

19. For a *Steam Bug Destroyer;* Jonathan Howlet, Greensboro', Guilford county, North Carolina, July 8.

Woe to the bed-bugs, should these steam bug destroying machines become as numerous as washing, thrashing, and churning machines, of which there seems to be some danger. This is the second from North Carolina, a State by no means prolific in patented inventions. In vol. xiii., p. 313, we described one from the State of New-York, and, not long since, there was one from the far West; and, what is somewhat curious, they are all alike, and are also all of them similar to such as had been previously described in the English journals. As the bugs are doomed to destruction, it might be some consolation to them in their dying ago-

nies, to know that their enemies will not be able to sustain the right which they claim to their "infernal machines," under the patent laws, the great seal to the contrary notwithstanding.

20. For *Propelling Wheels;* William Kelly, city of Pittsburgh, Pennsylvania, July 10.

21. For propelling machinery by *Horse Power;* Eliakim Briggs, Fort Covington, Franklin county, New-York, July 12.

This is the common, inclined, movable floor, upon which the horse is to walk. The cross slats are to be connected together by staples and links on their under sides, which, by their bearing against each other, as the floor becomes straight, are to sustain it, with the horse, or horses, upon it. The doing this by means of the staples and links, is the part claimed as an improvement. There are at least two existing patents for sustaining such a floor, without ways between the drums at the ends; in both these instances, however, blocks, or stops, attached to, and rising to some height above, the upper sides of the slats, were to be brought into contact by the straightening of the floor. This latter method is undoubtedly preferable to that designated in the foregoing patent, but neither of them can be safely depended upon, with the weight of a horse upon the floor, as it is subjected to a leverage which will, sooner or later, cause them to fail.

22. For a *Chain of Boats,* for inland navigation; Gurdon F. Saltonstall, Darlington District, South Carolina, July 12.

As the title indicates, these boats are to be so constructed that two, three, or more, may be linked together. Those forming the two ends present a sharp bow to the water, whilst the joining ends terminate abruptly, so that, when brought together, and linked, they form one continuous boat. The specification points out the advantages to be derived from boats thus constructed, and the patentee manifestly supposes that the idea of thus connecting boats is altogether new; in this, however, he is mistaken, as will presently appear. He, in fact, seems to think that the whole arrangement proposed by him is original, as he does not make any claim, or attempt to point out in what respect the invention is to be considered as new.

In vol. xii., p. 235, canal boats are described, for which a patent was obtained, April 6th, 1833. Six, or any other number of sections, were to be joined together, the two end sections being so formed as to cause them to pass readily through the water, the others being square, to admit of their being conveniently linked together, just as in the case before us. It is scarcely necessary to go further back, in order to prove the truth of the assertion above made.

23. For a *Machine for Drawing Boots;* Lewis Dole, and Nathaniel Peckard, Bowley, Essex county, Massachusetts, July 12.

24. For *Locks for Doors;* Simon Pettes, Bellows Falls, Windham county, Vermont, July 12.

25. For an improved *Cider Mill;* Nathan Booth, Cheshire, New-Haven county, Connecticut, July 12.

This cider mill is to be made in the form of the old-fashioned coffee or bark mill, with a conical nut, and a shell adapted to it, both of which are to be made of wood, the grooves or spirals upon them being formed by bars of iron fixed upon each, at an angle of about forty-five degrees. These bars are to be an inch wide, and half an inch thick; they are to project their whole thickness at the upper, or feeding end, but are to be let into the nut and shell, so that, at their lower ends, they shall not rise more than a sixteenth of an inch. The wood between them, at the upper ends, is to be grooved out, so as readily to admit the apples.

26. For an improvement in the mode of manufacturing of *Plates for Gun Barrels;* Harvey Mills, Springfield, Hampden county, Massachusetts, July 12.

The plates are to be prepared for welding, by rolling, instead of by forging, as has been usually done. The rollers are to be somewhat more in circumference than the length of the barrel to be formed, and are to be geared together in the ordinary way.

Flat bars are to be employed, of about three fourths of an inch thick, and wide enough to form the butt of the plate by rolling longitudinally; and in order to give the taper required, both in width and thickness, the bar is first rolled edgewise through eccentric grooves, wide enough to receive it, and is thus reduced to the

proper width. It is then rolled flatwise through another groove, or grooves, so formed as to give it the required thickness at the butt, the muzzle, and the intermediate parts. The scarfing is performed in the same way, in suitable grooves, as is likewise the grooving by which it is finally prepared for welding.

27. For a *Pump Gauge*, for ascertaining the depth of the water in the hold of a vessel; James D. Woodside, city of Washington, District of Columbia, July 14.

29. For an improvement in *Railroad Cars;* Joseph S. Kite, city of Philadelphia, July 14.

30. For a *Platform Balance* for weighing; Samuel L. Hay, city of Boston, Massachusetts, July 14.

31. For a *Bedstead for Invalids;* William Leo Woolf, city of New-York, July 15.

This bedstead differs materially, in its construction, from those ordinarily made for invalids, of which several are patented, and many others described in medical books, most of them bearing a strong resemblance to each other. That before us is intended to be inclined in any direction that may be required; for which purpose, the sacking, or girths, upon which the mattress rests, is attached to a frame placed within the ordinary rails of the bedstead, and is so made that it can be detached from this frame at pleasure. The secondary frame is made to swing on centre pins, passing through the head and foot rails, and on similar ones passing through the side rails, there being other pins to detain it in a horizontal position, or any other in which it may be placed.

By swivelling on the head and foot pins, the patient may have his bed inclined in either direction, provision being made for placing a side board, duly lined and wadded, to support him as the apparatus is turned round. If necessary, the frame upon which he rests can be inverted. When this is to be done, a mattress is placed upon him, over which girths are passed by means of fixtures for that purpose, and a support is provided for his head. When inverted, the original bottom and mattress may be removed, and that and the clothes renewed.

32. For a *Cooking Stove;* Samuel W. Phelps, Cincinnati, Hamilton county, Ohio, July 16.

33. For a *Rarefying Oven Cook Stove;* Samuel W. Phelps, Cincinnati, Hamilton county, Ohio, July 16.

34. For a machine for *Cutting Laths;* Dana Hubbard, Wheeling, Ohio county, Virginia, July 18.

A plank, of about eight feet in length, is to be fixed so as to slide backward and forward, horizontally, in grooves made for that purpose, in a strong bench or frame. The plank is to receive its traversing motion of about eight inches, from a pitman, or shackle bar, attached to one end of it, which is acted upon by a crank on a fly-wheel shaft. A knife, the full length of a lath, and from four to six inches wide, is to be fixed upon the sliding plank obliquely, making an angle of about 20 degrees with the edge thereof. The stuff to be cut is first sawed into boards, and then cross-cut to the length of a lath; these boards are dropped edgewise into a groove falling so as to be cut by the knife, the board bearing against a cutting block, faced with steel on its under side. The laths pass, as they are cut, through an opening made in the plank for that purpose.

35. For a *Cheese Press;* Sylvester Kibbe, Schoharie, Schoharie county, New-York, July 18.

36. For a *Steam Fireplace;* John W. Cochran, Lowell, Middlesex county, Massachusetts, July 18.

The apparatus here patented is intended to heat dwelling houses, ships, and other places, by means of steam generated by a fire in a common open fireplace, or caboose, without interfering with the use of the fire for culinary or other purposes.

A boiler of metal is to be made in the form of the back and jams of an ordinary fireplace. The back part of this boiler is to fit against the back of the fireplace, and its ends against the jambs; it is not, however, we apprehend, to be in contact with them, but at a sufficient distance to allow heated air and flame to pass between them. The height of this boiler, judging from the drawing, will be about equal to that of the breast of the fireplace, and its depth at bottom about a foot, whence it is to slope back as it ascends; it is to have feet at the bottom, to

raise it from the hearth. There are to be two long rectangular cavities in the front, something like ovens, into which the flame is designed to enter, to increase the heating effect, the double plates surrounding these cavities. Water is to be admitted through a pipe at top, and steam is to escape through another pipe, and to be thence conducted around a room, or wherever it may be wanted.

37. For a *Bush for Mill Spindles;* Samuel Merchant, Ohio county, Virginia, July 22.

Metallic wedges are to be so placed in the common wood bush as to form a collar around the neck of the spindle, with a piece of gum elastic, or some similar material, between the wood and the metallic wedge, so as to give elasticity thereto, and thus to relieve it, in some degree, from dead friction.

38. For an *Improvement in Wagons, or other Wheeled Carriages;* Reuben Rich, Albion, Oswego county, New-York, July 22.

The specification of this improvement is somewhat laconic, yet the writer terminates his description as though the few remarks made had been productive of some fatigue. The whole which can be called descriptive is in the following words: "The wheels are the same as common carriages, except the hubs, and the axles in the hubs. The axle in the hubs is a bar of iron through the hub, with the ends made round, sticking out of the hubs about two or three inches, as the case may be. These axles are made permanent in the hubs, and revolve round with the wheels, and the frame is explained in the drawing; so it needs no further explanation about it."

39. For a *Retaining Box for Oil in Upright Journals;* Henry Barton, Rochester, Monroe county, New-York, July 22.

Below the box in which the upper gudgeon of a vertical shaft revolves, there is to be a cup for containing oil. The box is secured to the framework by a flanch on its upper side, and descends upon the gudgeon so that a cap fastened upon the shaft, just below the box, may have its sides rise so as to surround the said box, without touching it. The cup may then be nearly filled with oil, which, from the height of the rim of the cup, will necessarily flow in between the gudgeon and the box. When the shaft is to have a rapid motion, this, as the cup revolves with it, would tend, by centrifugal force, to throw the oil out of the cup; a recess, or groove, is, therefore, formed round the lower part of the cup, to retain the larger portion of the oil, and thus to counteract its tendency to overflow.

The advantages derived from the application of the retaining box are stated to be, "first, the effectual preservation of all such bearings from becoming dry, heating, and wearing, and deranging their relative positions, prevent fire from friction, which has not unfrequently been the result of rapid motion. Secondly, a great saving of oil, as the cup saves all that is applied. Thirdly, a saving of time, for, with the addition of the retaining cup, once a week will be often enough to apply oil, when, without it, from once to four times a day is required, in most cases. Fourthly, cleanliness in all fine machinery, as nothing can flow down the shaft, or spindle, to foul or otherwise disfigure or injure below."

40. For a machine for *Blocking Horse Collars;* Nathan Post, Norfolk, St. Lawrence county, New-York, July 24.

41. For a *Regulated Pressure Engine;* Daniel Livermore, Civil Engineer, Blairsville, Indiana county, Pennsylvania, July 24.

This is a very ingeniously contrived hydraulic engine, for applying the power of water to drive machinery, by a regulated pressure. The description of it is of great length, and it was our design to have epitomized it, accompanying our account with the necessary cuts. The article is not, however, yet prepared, and as we anticipate the reception of an account of its actual operation from the inventor, who is engaged in carrying it into practical operation, we shall, for a time, postpone the intended publication.

42. For a *Plough;* Henry Peachey, city of Philadelphia, July 25.

43. For a *Thrashing Machine*; Gideon Hotchkins, Windsor, Broome county, New-York, July 25.

Although a very labored description is given of this thrashing machine, and certain distinct claims are made, there still is not, in our apprehension, any thing presented which is new. The machine

is of the cylinder and concave kind, with beaters which swing upon bolts passing through circular heads, in a way that is well known.

44. For improvements in the *Process of Tanning;* Edward S. and Daniel Bell, Smithfield, Jefferson county, Virginia, July 28.

45. For a *Female Auger for cutting Wagon Spoke Tenons;* John Lenher, Cocalico township, Lancaster county, Pennsylvania, July 28.

Bitts for cutting round tenons, or pins, have been long and well known, and have also been used for tenoning spokes for wheels. So far as we can judge from a very imperfect description, there is nothing new in the one which is the subject of this patent; if there is, it consists merely in a change of shape, without the production of any new effect, or the employment of any improved means.

A patent was obtained for an improvement in augers, or bits, of this kind, by Mr. Abel Conant, in June, 1829, as may be seen by turning to p. 176, vol. iv.; at which time it was not pretended that there was any thing new in the thing itself. The plan, as there proposed, we think decidedly superior to that now offered.

46. For a *Saw Knife;* Lorenzo Graham, Paris, Oneida county, New-York, July 29.

Take a common knife, and cut teeth in the back of it, and you have the patent *saw knife,* which, we are told, may be used for culinary purposes, for pruning, or for any thing else which may be found suitable.

47. For an improvement in the mode of *Chilling Cast Iron Wheels for Railroad Cars;* Phineas Davis, Civil Engineer, city of Baltimore, July 29.

48. For promoting the *Combustion of Anthracite, in Locomotive and other Steam Engines;* Phineas Davis, Civil Engineer, city of Baltimore, July 29.

[From the Asiatic Journal.]

THE OVERLAND JOURNEY FROM INDIA.—Dr. James Burnes, who was one of the passengers in the Hugh Lindsay steamer, from Bombay, in letters to his friends, extracts of which are given in a Scotch paper,* has furnished an account of the voyage and journey, from whence we extract some of the most material circumstances.

The steamer sailed on the 1st February, under the command of Capt. Wilson, with an agreeable party of passengers. She carried thirteen days' supply of coal; her average sailing was not more than six knots an hour, varying from four and a half to eight, although the weather was fine. From Cape Fartash, which was described on the 9th, the steamer skirted the Arabian shore, along a gloomy and thinly peopled coast. On the 11th, she took in a supply of coals at Maculla, a paltry town of dirty hovels, overlooked by barren mountains of great height, and inhabited by 1,000 or 1,500 half naked savages, most of whom were armed with swords, daggers, and shields. On visiting the Shekh or governor and his son, whom they found seated on a mat in the corner of a wretched apartment, during the interview, some negroes among the attendants were offered them for sale by persons in the room.

Owing to the rejoicings for the termination of the Ramazaan, the coals could not be got on board till the 13th, when the Hugh Lindsay weighed anchor, and on the 15th entered the Red Sea, the weather being unusually fine; but the next day her progress was checked by a strong N. W. gale off the desert island Jebel Zyghar, and Captain Wilson put back to Mocha. The decline of this celebrated city, owing chiefly to the imbecile and dissolute character of the Iman of Senna, was marked by the absence of ships from its harbor; an American trader and two Egyptian men of war were all that were seen in the roads. The city itself was in the possession of a body of wild Bedouin Arabs, who had seized and sacked it some days before. The streets were a spectacle of desolation, most of the inhabitants having fled to the desert, and nothing being exposed for sale in the bazaars. The rude Arab chief, however, who had established himself as governor, received our countrymen very civilly.

Early on the 18th, the steamer resumed her voyage, and continued to propel against a constant gale till the evening of the 22d, when off Jedda, though she could not enter that harbor till next morning, in consequence of the dangerous coral reefs. The streets, markets, and numerous coffee houses of Jedda were found full of troops, —the head-quarters of Ahmet Pacha, the generalissimo of the army of the Hedjaz, destined for the subjugation of southern Arabia, being then within a few miles of it. The soldiers were armed and disciplined in the French fashion; but were far inferior in every respect to Indian sipahis. There were eight or nine Italian officers with the army; and, strange to say, a St.

---

* The Montrose Review.

Simonian Frenchman, who had penetrated into that distant country, with the double purpose of searching for the *mere*, and disseminating his doctrines. In this lately bigotted city our travellers overtook the Rev. Joseph Wolff, who preached fearlessly with the Bible in his hand, at one of the chief entrances, to a crowd of at least 200, composed chiefly of armed soldiers, who offered him no indignity. The European visitors were most courteously received by Suleiman Aga, the Governor; they walked without molestation through the Medina gate to inspect the tomb of Eve, and the cantonment of the troops; and no objection was made (except by some idle children, who threw a few stones at them,) to their re-entering by the Mecca gate at sunset, so as to witness the departure of the pilgrims, which Dr. B. describes as a most interesting spectacle. That day's caravan (for one leaves Jedda every evening for Mecca) consisted of 200 or 300 camels, which carried the aged and infirm amongst the pilgrims, most of whom, however, strode boldly forward, barefooted and bareheaded. Amongst them were several Persian and Hindostan Mussulmans; and there were some, who, from their countenances, must have met at this spot from the confines of China and Tartary, and the west coast of Africa.

On the 25th the Hugh Lindsay proceeded on her voyage, and again encountered an almost continual tempest to Cosseir. The decks were constantly wet, and the paddle-boxes broken by the force of the sea, which was so heavy that her speed at one time was reduced to two or three miles an hour. Late on the evening of the 28th the land of Egypt was visible at a distance, and at four o'clock on the 1st of March, she anchored at Cosseir; from whence, after landing some passengers for Thebes, she again sailed on the 2d, and ran a distance of 260 miles over smooth water, in about thirty-nine hours. Early on the 3d she entered the Straits of Jubal, and dropped anchor on the morning of the 4th in Suez roads. The Hugh Lindsay had now completed her voyage; and though struggling for nearly 1000 miles amidst the dangers of the Red Sea, against a strong adverse gale and heavy waves, had run 3242 miles in 31½ days, including stoppages, which amounted to 6½. She is, however, described as a vessel unsuited for long passages; and, in addition to the extra weight of coals, was encumbered with two heavy engines of eighty-horse power to a tonnage of little more than 400.

Suez and Cosseir are miserable towns, composed chiefly of clay-built houses, and almost entirely dependent on the pilgrims who pass through them for Mecca. The Cavendish Bentinck, an English ship, having carried away 500 or 600 of these wanderers from the former, a few days before the steamer arrived, it looked particularly desolate. The streets of Cosseir, however, were full of well-dressed Mahommedans of all nations; and the number of vessels in its port showed it to be a place of considerable resort, though it can never be a populous town, as it contains no water except what is sold in the bazaars, and which is brought from the banks of the Nile, 125 miles across the desert. At Suez, the water is so bitter as to be scarcely drinkable. On the 5th of March, the passengers disembarked from the steamer, and after taking a slight repast in a room which had been occupied by Bonaparte, about two o'clock commenced their journey across the Isthmus of Suez to Cairo, 75 miles, Capt. Wilson and two of the officers of the Hugh Lindsay having resolved to accompany them. The caravan consisted of twelve gentlemen mounted on dromedaries, attended by Arab guides, and followed by thirty or forty camels, carrying the water, baggage, tents, and requisite supplies. This journey was accomplished in four days, and was attended with few of the usual discomforts, as the party had furnished themselves with most of the comforts and even luxuries of life, in respect to provisions. One had brought London soups and Scotch salmon; another produced a ham and tongues; a third, French bouille, champagne, claret, &c. Fowls, mutton, and bread, were in profusion; and, in fact, there was abundance of every thing except water, which some of the party had neglected to bring in bottles from Bombay, and a quart of which was considered more valuable than wine before the journey was over. On the 8th, they met the poor Dey of Algiers, who, with his harem and attendants, was proceeding to Mecca; and by one o'clock they entered one of the stupendous Saracen gates of Cairo, having, in the course of a short half hour, made a transition from a silent wilderness into the heart of a mighty metropolis, swarming with human beings, and filled with interesting objects.

They remained at Cairo five days, inspecting the curiosities in the city and its neighborhood, and were presented to the Pasha, who, though the war in Yemen appeared to be his favorite topic, declared his intention of making a railroad across the Isthmus of Suez, for which purpose English engineers are already engaged in surveys. On the 13th, Dr. Burnes and some of the party embarked at Boulac, on the Nile, entered the Mehmoudieh canal, and arrived at Alexandria, which on the 20th he left, with the Rev. Mr. Wolff, for Malta, where they arrived on the 4th April, and were shut up in the Lazaretto for twenty days.

[From the American Railroad Journal.]

On the Use of Locomotive Engines on Common Roads—in reply to Mr. G. Ralston.

Sir,—On perusing No. 49, Vol. 3,* of your Journal, my attention was attracted by a letter from your respectable correspondent, Mr. Ralston, on the use of locomotive engines on common roads. He appears to be satisfied that they may, under favorable circumstances, compete with animal power in England, but doubts whether they will answer as well in the United States. My purpose is to invite attention to the reasons given by Mr. R. for this conclusion, and to the means of obviating such objections as appear to be most formidable. The facts on which Mr. R. has founded his conclusion may be classed under two general heads: 1. The greater economy of steam power and machinery in England than in the United States, and the greater economy of animal power in the United States than in England; 2. The imperfect condition of our roads, compared with those of England. As to the first point, I would observe, that although the facts stated are no doubt true, yet it does not follow from them, that steam power is not cheaper than animal power in the United States. The difference is not so great as in England, but it is fully proved by experience, that steam power applied on a railroad is, if any, little more than half the expense of animal power. It may be further remarked, that the application of steam in propelling a locomotive on an iron rail, is subject to a peculiar disadvantage in comparison with animal power, which would not occur upon a common road. This arises from the slipping of the car wheels on ascents, *before the engine has exerted her full power*. To avert this great inconvenience, the weight of the engine must be increased to obtain sufficient adhesion; which additional weight requires an extra, and otherwise superfluous, force to propel it. It is conceded, I believe, that on the common road there is no want of adhesion, and hence lighter engines may be employed with decided advantage. These facts show, that the difference of expense between steam and animal power must be greater on common roads than on a railway; and whatever may be the advantages of that power on the railroad, we have an assurance of a still greater relative advantage on the common road. The first objection suggested by Mr. Ralston does not, therefore, as I think, sustain his doubt of the profitable substitution of steam for animal power on the common road in the United States. The next objection, founded on the imperfect condition of our roads, is altogether conclusive: no engineer, in his senses, would risk a locomotive engine upon the convex, uneven, and rough surface of our best turnpike roads. If, therefore, we would employ the locomotive off the railroad, it must not be on a *common*, but a *proper* road, made for, and restricted exclusively to, that purpose; which, I apprehend, could be better adapted to the locomotive than even the best roads in England, especially if the wheels of the locomotive are made very wide, and otherwise perfectly adapted for this use. Having explained the plan of such a road in No. 5, Vol. 3, of your Journal, I need not repeat the explanation here, but would remark in addition, that the great difficulty of arranging the business on a railroad, so as to admit of its general use for vehicles of different owners, running at various speeds, threatens to become a permanent obstacle to its utility, and especially its popularity. A proper locomotive road, suited for the meeting and passing of trains every where, would compensate for a considerable diminution of the load now drawn on a railroad. The Columbia railroad in Pennsylvania, made by the State, has been opened for general use with double tracks, but the interruptions are so frequent, that the stages propelled by locomotives can only run 8 or 9 miles an hour. It has therefore been proposed by the State authorities, to manage the whole transportation by their agents, in order to regulate the times for starting, meeting, passing places, &c. But this indispensable measure is about to be strenuously opposed by the inhabitants on the borders. A hard gravel or stone road, graded for the purpose, and made wide enough for vehicles to pass or meet, would remove all necessity for this arrangement, and individuals or companies, as many as might choose to embark, could establish trains for travelling or freight, securing to the public all the benefits of the most active competition. Yours, &c.

J.

Dec. 29, 1834.

* See page 358, vol. iv., of this Magazine.

[From the Repertory of Patent Inventions.]

Report on the Progress and Present State of our Knowledge of Hydraulics as a Branch of Engineering. By George Rennie, Esq., F. R. S., &c. &c. Part I.

(Continued from page 8.)

The object of M. Girard's experiments was to determine this velocity; and this he has effected in a very satisfactory manner, by means of twelve hundred experiments, performed with a series of copper tubes, from 1·83 to 2·96 millimetres in diameter, and from 20 to 222 centimetres in length; from which it appeared, that when the velocity was expressed by 10, and the temperature was 0, centigrade, the velocity was increas-

ed four times when the temperature amounted to 85 degrees. When the length of the capillary tube was below that limit, a variation of temperature exercised very little influence upon the velocity of the issuing fluid, &c.

It was in this state of the science that M. Prony, (then having under his direction different projects for canals,) undertook to reduce the solution of many important problems on running water to the most strict and rigorous principles, at the same time capable of being applied with facility to practice.

For this purpose he selected fifty-one experiments which corresponded best on conduit pipes, and thirty-one on open conduits. Proceeding, therefore, on M. Girard's theory of the analogy between fluids and a system of corpuscular solids or material bodies, gravitating in a curvilinear channel of indefinite length, and occupying and abandoning successively the different parts of the length of channel, he was enabled to express the velocity of the water, whether it flows in pipes or in open conduits, by a simple formula, free of logarithms, and requiring merely the extraction of the square root.*

Thus $v = -0{\cdot}0469734 + \sqrt{0{\cdot}0022065 + 3041{\cdot}47 \times G}$, which gives the velocity in metres: or, in English feet,

$$v = -0{\cdot}1541131 + \sqrt{0{\cdot}023751 + 32806{\cdot}6 \times G}.$$

When this formula is applied to pipes, we must take $G = \frac{1}{4}$ D K, which is deduced from the equation $K = \frac{H + Z = H}{L}$. When it is applied to canals, we must take $G =$ R I, which is deduced from the equation $I = \frac{Z}{L}$, K being equal to the mean radius of Dubuat on the hydraulic mean depth, and I equal to the sine of inclination in the pipe or canal. M. Prony has drawn up extensive tables, in which he has compared the observed velocities with those which are calculated from the preceding formulæ, and from those of Dubuat and Girard. In both cases the coincidence of the observed results with the formulæ is very remarkable, but particularly with the formulæ of M. Prony. But the great work of M. Prony is his *Nouvelle Architecture Hydraulique*, published in the year 1790. This able production is divided into five sections, viz. Statics, Dynamics, Hydrostatics, Hydrodynamics, and on the physical circumstances that influence the motion of machines. The chapter on hydrodynamics is particularly copious and explanatory of the motions of compressible and incompressible fluids in pipes and vessels, on the principle of the parallelism of the fluid filaments, and the efflux of water through different kinds of orifices made in vessels kept constantly full or permitted to empty themselves; he details the theory of the clepsydra, and the curves described by spouting fluids; and having noticed the different phenomena of the contraction of the fluid vein, and given an account of the experiments of Bossut, M. Prony deduces formulæ by which the results may be expressed with all the accuracy required in practice.

In treating of the impulse and resistance of fluids, M. Prony explains the theory of Don George Juan, which he finds conformable to the experiments of Smeaton, but to differ very materially from the previously received law of the product of the surfaces by the squares of the velocities, as established by the joint experiments of D'Alembert, Condorcet, and Bossut, in the year 1775. The concluding part of the fourth section is devoted to an examination of the theory of the equilibrium and motion of fluids according to Euler and D'Alembert; and by a rigorous investigation of the nature of the questions to be determined, the whole theory is reduced to two equations only, in narrow pipes, according to the theory of Euler, showing its approximation to the hypothesis of the parallelism of filaments.

The fifth and last section investigates the different circumstances, such as friction, adhesion, and rigidity, which influence the motion of machines.

A second volume, published in the year 1796, is devoted to the theory and practice of the steam-engine. Previously to the memoir of M. Prony, *Sur le Jaugeage des Eaux Courantes*, in the year 1802, no attempt had been made to establish with certainty the correction to be applied to the theoretical expenditures of fluids through orifices and additional tubes. The phenomenon had been long noticed by Sir Isaac Newton, and illustrated by Michelotti by a magnificent series of experiments, which, although involving some intricacies, have certainly formed the ground-work of all the subsequent experiments upon this particular subject.

By the method of interpolation, M. Prony has succeeded in discovering a series of formulæ applicable to the expenditures of currents out of vertical and horizontal orifice, and to the contraction of the fluid vein; and in a subsequent work, entitled *Recherches sur le Mouvemens des Eaux Courantes*, he establishes the following formulæ for the mean velocities of rivers.

When V = velocity at the surface,
and U = mean velocity,
$U = 0{\cdot}816458$ V,
which is about $\frac{4}{5}$ V.

* Memoires des Savans Etrangers, &c., 1815.

These velocities are determined by two methods. 1st. By a small water-wheel for the velocity at the surface, and the improved tube of Pitot for the velocities at different depths below the surface.

If h = the height of the water in the vertical tube above the level of the current, the velocity due to this height will be determined by the formulæ

$$V = \sqrt{2 g h} = \sqrt{\overset{\text{metres}}{19{\cdot}606}\, h} = 4{\cdot}429 \sqrt{h}.$$

When water runs in channels, the inclination usually given amounts to between $\frac{1}{300}$th part of the length, which will give a velocity of nearly $1\frac{1}{4}$ mile per hour, sufficient to allow the water to run freely in earth. We have seen the inclination very conveniently applied in cases of drainage at $\frac{1}{1200}$th and $\frac{1}{1300}$ th, and some rivers are said to have $\frac{1}{5000}$th only.

M. Prony gives the following formula from a great number of observations:

If U = mean velocity of the water in the canal,
I = the inclination of the canal per metre,
R = the relation of the area to the profile of its perimeter,

we shall have

$$U = -0{\cdot}67 + \sqrt{0{\cdot}005 + 3233.\ R.\ I};$$

and for conduit pipes,

calling U = the mean velocity,
Z = the head of water in the inferior orifice of the pipe,
L = the length of the pipe in metres,
D = the diameter of the pipe,

we shall have, U = —

$$0{\cdot}0248829 + \sqrt{0{\cdot}000619159 + 717{\cdot}857 \frac{DZ}{L}};$$

or, where the velocity is small,

$$U = 26{\cdot}79 \sqrt{\frac{DZ}{L}};$$

that is, the mean velocities approximate to a direct ratio compounded of the squares of the diameters and heads of water, and inversely as the square root of the length of the pipes: and by experiments made with great care, M. Prony has found that the formula, U = —

$$0{\cdot}0248829 + \sqrt{0{\cdot}000619159 + 717{\cdot}857 \frac{DZ}{L}},$$

scarcely differs more or less from experiments than $\frac{1}{40}$ or $\frac{1}{25}$. The preceding formulæ suppose that the hor[illegible]al sections, both of the reservoir and the [illegible]ecipient, are great in relation to the transverse section of the pipe, and that the pipe is kept constantly full.*

In comparing the formulæ given for open and close canals, M. Prony has remarked that these formulæ are not only similar, but the constants which enter into their composition are nearly the same, so that either of them may represent the two series of phenomena with sufficient exactness.

The following formula applies equally to open or close canals:

$$U = -0{\cdot}0468734 + \sqrt{\left(0{\cdot}0022065 + 3041{\cdot}47 \frac{DZ}{L}\right\}}.$$

But the most useful of the numerous formulæ given by M. Prony for open canals is the following:

Let g = the velocity of a body falling in one second,
w = the area of the transverse section,
p = the perimeter of that section,
I = the inclination of the canal,
Q = the constant volume of water through the section,
U = the mean velocity of the water,
R = the relation of the area to the perimeter of the section,

then, 1st,

$$0{\cdot}000436\, U + 0{\cdot}003034\, U^2 = g\, I\, R = g\, I \frac{w}{p};$$

2dly, $U = \frac{Q}{w}$;

3rdly, $R\, w^2 - 0{\cdot}000444499\,.\, w \frac{Q}{I} - 0{\cdot}000309314 \frac{Q^2}{I} = O.$

This last equation, containing the quantities

Q I w and $R = \frac{w}{p}$,

shows how to determine one of them, and, knowing the three others, we shall have the following equations:

4thly, $p = \dfrac{g\, I\, w^2}{0{\cdot}000436\, Q\, w + 0{\cdot}003034\, Q^2}$;

5thly,

$I = \underline{p\,(0{\cdot}0000444499\, Q\, w + 0{\cdot}000309314\, Q^2)}$;

6thly, $w = 0{\cdot}000436 \pm \dfrac{\sqrt{[(0{\cdot}000436)^2 + 4(0{\cdot}003034)\, g\, R\, I]}\, Q}{2 g\, R\, I}.$

These formulæ are, however, modified in rivers by circumstances, such as weeds,

* According to Mr. Jardine's experiments on the quantity of water delivered by the Coniston Main, from Coniston to Edinburgh, the following is a comparison:

	Scots Pints.
Actual delivery of Coniston Main	189·4
Ditto by Eytelwein's formula	189·77
Ditto by Girard's formula	189·26
Ditto by Dubuat's formula	188·13
Ditto by Prony's simple formula	192·32
Ditto by Prony's tables	180·7

vessels, and other obstacles in the rivers; in which case M. Girard has conceived it necessary to introduce into the formulæ the co-efficient of correction $= 1{\cdot}7$ as a multiplier of the perimeter, by which the equations will be,

$$p - 1{\cdot}7\,(0{\cdot}000436\,U + 0{\cdot}003034\,U^2) = g\,I\,w.$$

The preceding are among the principal researches of this distinguished philosopher.*

In the year 1798, Professor Venturi of Modena published a very interesting memoir, entitled *Sur la Communication laterale du Movement des Fluides*. Sir Isaac Newton was well acquainted with this communication, having deduced from it the propagation of rotatory motion from the interior to the exterior of a whirlpool; and had affirmed that when motion is propagated in a fluid, and has passed beyond the aperture, the motion diverges from that opening, as from a centre, and is propagated in right lines towards the lateral parts. The simple and immediate application of this theorem cannot be made to a jet or aperture at the surface of still water. Circumstances enter into this case which transform the results of the principal into particular motions. It is nevertheless true, that the jet communicates its motion to the lateral parts without the orifice, but does not repel it in a radial divergency. M. Venturi illustrates his theory by experiments on the form and expenditure of fluid veins issuing from orifices, and shows how the velocity and expenditure are increased by the application of additional tubes; and that in descending cylindrical tubes, the upper ends of which possess the form of the contracted vein, the expense is such as corresponds with the height of the fluid above the inferior extremity of the tube. The ancients remarked that a descending tube applied to a reservoir increased the expenditure.† D'Alembert, Euler, and Bernoulli, attributed it to the pressure of the atmosphere. Gravesend, Guglielmini, and others, sought for the cause of this augmentation in the weight of the atmosphere, and determined the velocity at the bottom of the tube to be the same as would arise from the whole height of the column, including the height of the reservoir. Guglielmini supposed that the pressure at the orifice below is the same for a state of motion as for that of rest, which is not true. In the experiments he made for that purpose, he paid no regard either to the diminution of expenditure produced by the irregularity of the inner surface of the tubes, or the augmentation occasioned by the form of the tubes themselves. But Venturi established the proposition upon the principle of vertical ascension combined with the pressure of the atmosphere, as follows:

1st. That in additional conical tubes the pressure of the atmosphere increases the expenditure in the proportion of the exterior section of the tube to the section of the contracted vein, whatever be the position of the tube.

2dly. That in cylindrical pipes the expenditure is less than through conical pipes, which diverge from the contracted vein, and have the same exterior diameter. This is illustrated by experiments with differently formed tubes, as compared with a plate orifice and a cylindrical tube, by which the ratios in point of time were found to be 41″, 31″, and 27″, showing the advantage of the conical tube.

3dly. That the expenditure may be still further increased, in the ratio of twenty-four to ten, by a certain form of tube,—a circumstance of which he supposes the Romans were well aware, as appears from their restricting the length of the pipes of conveyance from the public reservoirs to fifty feet; but it was not perceived that the law might be equally evaded by applying a conical frustum to the extremity of the tube.

M. Venturi then examines the causes of eddies in rivers; whence he deduces, from his experiments on tubes with enlarged parts, that every eddy destroys part of the moving force of the current of the river, of which the course is permanent and the sections of the bed unequal; that the water continues more elevated than it would have done if the whole river had been equally contracted to the dimensions of its smallest section, a consequence extremely important in the theory of rivers, as the retardation experienced by the water in rivers is not only due to the friction over the bed, but to eddies produced from the irregularities in the bed, and the flexures or windings of its course: a part of the current is thus employed to restore an equilibrium of motion, which the current itself continually deranges. As respects the contracted vein, it had been pretended by the Marquis de Lorgna* that the contracted vein was nothing else but a continuation of the Newtonian cataract, and that the celerity of the fluid issuing from an orifice in a thin plate, is much less than that of a body which falls from the height of the charge. But Venturi proved that the contraction of the vein is incomparably greater than can be produced by the acceleration of gravity, even in descending streams: the contraction of the

* Recherches Physico-Mathematiques sur la Theorie des Eaux courantes, par M. Prony.

† "Calix devexus amplius rapit."—[Frontinus de Aqueductibus.] See also the Pneumatics of Hero.

* Memoire della Societa Italiana, vol. iv.

stream being 0·64, and the velocity nearly the same as that of a heavy body which may have fallen through the height of the charge. These experimental principles, which are in accordance with the results of Bossut, Michelotti, and Poleni, are strictly true in all cases where the orifice is small in proportion to the section of the reservoir, and when that orifice is made in a thin plate, and the internal afflux of the filaments is made in uniform manner round the orifice itself.

Venturi then shows the form and contraction of the fluid vein, by increased charges. His experiments with the cone are curious; it would have been greatly to be regretted that he had stopped short in his investigations, but for the more extensive researches of Bidone and Lesbros. M. Hachette, in opposition to the theory of Venturi, assigns, as a cause of the increase by additional tubes, the adhesion of the fluid to the sides of the tubes arising from capillary attraction.

(*To be continued.*)

Suspension Bridges, No. I.

To the Editor, &c.

Sir,—It has occurred to me, since I sent you the drawing of the suspension bridge, for forming a connection between New-York and Brooklyn, that a short descriptive account of the principal suspension bridges now in existence would be interesting to many of your readers. Should you concur with me in this opinion, I will, at my leisure, furnish you with a series of papers on the subject, commencing with the following.

We are informed by travellers, that suspension bridges, formed of chains of iron, are now to be seen in China and the East Indies of great antiquity; but as these are of such a description as to furnish no practical information relative to the mode of constructing modern suspension bridges, we shall not trouble your readers with any account of them here.

With the exception of the Winch bridge, constructed about the year 1741, it does not appear that any bridges on the suspension principle were to be found in Europe till the 19th century. This bridge is described in Hutchinson's antiquities of Durham, printed at Carlisle in 1794, in the following words:

"About two miles above Middleton, where the river falls in repeated cascades, a bridge, *suspended on iron chains* is stretched from rock to rock, over a chasm near 60 feet deep, for the passage of travellers, but particularly of miners. The bridge is 70 feet in length, and little more than 2 feet broad, with a hand rail on one side, and planked in such a manner that the traveller experiences all the tremulous motion of the chain, and sees himself suspended over a roaring gulf on an agitated and restless gangway."

The first suspension bridge in this country was built by Mr. Finley, of Pennsylvania, in 1796, across Jacob's creek, between Union Town and Greenburgh. The length of the bridge was 70 feet. Mr. Pope, in his treatise on bridge architecture, describes several others as having been erected by this gentleman. The largest across the Schuylkill is 306 feet long. It is borne by two chains, one on each side, the iron of which is $1\frac{1}{2}$ inch square. Another across the Brandywine at Wilmington is 145 feet long, 30 feet wide, and is borne by four chains, the iron of which is $1\frac{3}{8}$ inch diameter. In the same work we have also an account of a chain suspension bridge of considerable strength erected over the Merrimack, near Newburyport, Massachusetts, by John Templeman, Esq. The span of this bridge is 244 feet. The pieces upon which the timber framed work for suspending the chains is erected are of stone, 47 feet long and 37 feet high. The timber suspension frames are 35 feet high. The bridge is formed of 10 chains, the ends of which are carried down into deep wells in each bank, and are therein fixed to heavy stones; each chain is 516 feet long; and at the top of the suspension frames the chains are tripled and made with short links. The four middle joists rest on the chains, the rest are suspended from the chains by rods to keep the road horizontal. There are two roadways, 15 feet in width each, and the floor is said to be so solid as to admit of horses, carriages, &c. to travel at any speed without occasioning any considerable vibration. The chains are arranged three on each side and four in the middle. The height from the water to the floor of the road-way is 40 feet. It is stated that the whole expense did not amount to 25,000 dollars.

In Mons. Cordier's Histoire de la Navigation Interieure, published in 1820, it

is stated that 40 bridges on Mr. Finley's plan had been erected, at that time, in this country. He mentions one, built in 1815, on the Lehigh, a mile below Northampton, it consists of two openings and two semi-arches; its whole length is 475 feet. The chains are placed so as to divide the platform into four ways, two for carriages in the middle, and a foot path on each side. The chains were made with iron bars $1\frac{3}{8}$ inch square. The cost, 20,000 dollars.

The attention of British engineers appears to have been first directed to the subject of suspension bridges in the year 1814, when it was proposed to substitute a bridge over the river Mersey in lieu of the ferry at Runcorn-gap, about twenty miles below Liverpool. From the nature of the navigation it was necessary that the bridge should consist of not more than three openings, the centre one of 1000 feet and two others of 500 feet each, and that its height above the surface of the water should not be less than 60 feet. The celebrated engineer, the late Mr. Telford, having been applied to on the subject, proposed the erection of a suspension bridge. It was to consist of 16 iron cables, each formed of 36 square half inch iron bars; and of the segments of cylinders proper for forming them into one immense cable, which, including the fixings on shore, was to be nearly half a mile long, and about $4\frac{1}{4}$ inches diameter. When this bridge was proposed there existed very little experience in the construction of suspension bridges, and in order to obtain proper data for proportioning the strength of the various parts, Mr. Telford instituted a very valuable course of experiments, some account of which I shall probably give in a future number. This bridge has not yet been erected, but as it served to call the attention of scientific men to the subject, and may thus be considered as the origin of the great extension that has since been given to this mode of bridge building in Europe, I thought this account of it here would not be out of place. W. L.

Dec. 15th, 1834.

P. S.—In making out the design of the suspension bridge over the East river, I have supposed the piers for the suspension towers, &c. to be constructed of masonry: this would evidently be the most durable mode of construction, but I could furnish a design for a very substantial bridge, the piers and suspension towers of which should be wholly constructed of timber. The expense would thus be very greatly reduced, as we could then dispense with the use of coffer-dams for the foundations of the piers. The cost of such a bridge would not, probably, much exceed the receipts of the Fulton Ferry company for one year.

Poets, Philosophers, and Artists, made by Accident.

"What a consolation for an aged parent to see his child, by the efforts of his own merits, attain from the humblest obscurity to distinguished eminence! What a transport for the man of sensibility, to return to the obscure dwelling of his parent, and to embrace him, adorned with public honors!"

Accident has frequently occasioned the most eminent geniuses to display their powers. It was at Rome, says Gibbon, on the 15th of October, 1764, as I sat musing amidst the ruins of the Capitol, while the bare-footed friars were singing vespers in the Temple of Jupiter, that the idea of writing the decline and fall of the City first started to my mind.

Father Malebranche having completed his studies in philosophy and theology, without any other intention than devoting himself to some religious order, little expected the celebrity his works acquired for him. Loitering in an idle hour in the shop of a bookseller, and turning over a parcel of books, *L'Homme de Descartes* fell into his hands. Having dipt into some parts, he read with such delight, that the palpitations of his heart compelled him to lay the volume down. It was this circumstance that produced those profound contemplations which made him the Plato of his age.

Cowley became a poet by accident. In his mother's apartment he found, when very young, Spenser's Fairy Queen: and, by a continual study of poetry, he became so enchanted of the Muse, that he grew irrecoverably a poet.

Dr. Johnson informs us, that Sir Joshua Reynolds had the first fondness of his art excited by the perusal of Richardson's Treatise.

Vaucanson displayed an uncommon genius for mechanics. His taste was first determined by an accident; when

young, he frequently attended his mother to the residence of her confessor; and while she wept with repentance, he wept with weariness! In this state of disagreeable vacation, says Helvetius, he was struck with the uniform motion of the pendulum of the clock in the hall. His curiosity was roused; he approached the clock-case, and studied its mechanism; what he could not discover, he guessed at. He then projected a similar machine; and gradually his genius produced a clock. Encouraged by this first success, he proceeded in his various attempts; and the genius which thus could form a clock, in time formed a flutting automaton.

"If Shakspeare's imprudence had not obliged him to quit his wool trade, and his town; if he had not engaged with a company of actors, and at length, disgusted with being an indifferent performer, he had not turned author, the prudent wool-seller had never been the celebrated poet."

"Accident determined the taste of Moliere for the stage. His grandfather loved the theatre, and frequently carried him there. The young man lived in dissipation; the father observing it, asked in anger, if his son was to be made an actor. "Would to God," replied the grandfather, "he was as good an actor as Montrose." The words struck young Moliere; he took a disgust to his tapestry trade; and it is to this circumstance that France owes her greatest comic writer."

"Corneille loved; he made verses for his mistress, became a poet, composed Melite, and afterwards his other celebrated works. The discreet Corneille had remained a lawyer."

"Thus it is, that the devotion of a mother, the death of Cromwell, deer-stealing, the exclamation of an old man, and the beauty of a woman, have given five illustrious characters to Europe."

We owe the great discovery of Newton to a very trivial accident. When a student at Cambridge, he had retired during the time of the plague into the country. As he was reading under an apple-tree, one of the fruit fell, and struck him a smart blow on the head. When he observed the smallness of the apple, he was surprised at the force of the stroke. This led him to consider the accelerating motion of falling bodies; from whence he deduced the principle of gravity, and laid the foundation of his philosophy.

Ignatius Loyola was a Spanish gentleman, who was dangerously wounded at the siege of Pampeluna. Having heated his imagination by reading the Lives of the Saints, which were brought to him in his illness, instead of romance, he conceived a strong ambition to be the founder of a religious order; whence originated the celebrated society of the Jesuits.

Rousseau found his eccentric powers first awakened by the advertisement of the singular annual subject which the academy of Dijon proposed for that year, in which he wrote his celebrated Declamation against the arts and sciences. A circumstance which determined his future literary efforts.

La Fontaine, at the age of twenty-two, had not taken any profession, or devoted himself to any pursuit. Having accidentally heard some verses of Malherbe, he felt a sudden impulse, which directed his future life. He immediately bought a Malherbe, and was so exquisitely delighted with this poet, that after passing the nights in treasuring his verses in his memory, he would run in the day-time to the woods, where, concealing himself, he would recite his verses to the surrounding dryads.

Flamstead was an astronomer by accident. He was taken from school on account of his illness, when Sacrobosco's book de Sphæra having been lent to him, he was so pleased with it, that he immediately began a course of astronomic studies. Pennant's first propensity to natural history was the pleasure he received from an accidental perusal of Willoughby's work on birds: the same accident, of finding, on the table of his professor, Reaumur's History of Insects, of which he read more than he attended to the lecture, and having been refused the loan, gave such an instant turn to the mind of Bonnet, that he hastened to obtain a copy, but found many difficulties in procuring this costly work; its possession gave an unalterable direction to his future life; this naturalist indeed lost the use of his sight by his devotion to the microscope.

Dr. Franklin attributes the cast of his genius to a similar accident. "I found a work of De Foe's, entitled an 'Essay on Projects,' from which perhaps I derived impressions that have since influenced some of the principal events of my life."

I shall add the incident which occasioned Roger Ascham to write his *Schoolmaster*, one of the most curious and useful treatises among our elder writers.

At a dinner given by Sir William Cecil, during the plague in 1563, at his apartments at Windsor, where the queen had taken refuge, a number of ingenious men were invited. Secretary Cecil communicated the news of the morning, that several scholars at Eton had run away on account of their master's severity, which he condemned as a great error in the education of youth. Sir William Petre maintained the contrary; severe in his own temper, he pleaded warmly in defence of hard flogging. Dr. Wootton, in softer tones, sided with the Secretary. Sir John Mason adopted no side, bantered both. Mr. Haddon seconded the hard-hearted Sir Wm. Petre, and adduced, as an evidence, that the best schoolmaster then in England was the hardest flogger. Then was it that Roger Ascham indignantly exclaimed, that if such a master had an able scholar it was owing to the boy's genius, and not the preceptor's rod. Secretary Cecil and others were pleased with Ascham's notions. Sir Richard Sackville was silent, but when Ascham after dinner went to the queen to read one of the orations of Demosthenes, he took him aside, and frankly told him that though he had taken no part in the debate, he would not have been absent from that conversation for a great deal; that he knew to his cost the truth Ascham had supported; for it was the perpetual flogging of such a schoolmaster, that had given him an unconquerable aversion to study; and as he wished to remedy this defect in his own children, he earnestly exhorted Ascham to write his observations on so interesting a topic. Such was the circumstance which produced the admirable treatise of Roger Ascham.

Manual Labor and Mental Cultivation.—"My conviction—not lightly taken up, but the result of long and earnest thought—is, that daily occupation with manual labor is in no way incompatible with the highest mental cultivation and refinement; that so far from the exercise of mechanical employment daily, for a moderate time, being detrimental to the mental powers, it has, on the contrary, a decided tendency to strengthen them; and that if those who at present serve the public in the capacity of writers, were to employ several hours a day in mechanical labor, their bodily health would be improved, and their writings would take a character of vigor, startling even to themselves. They would find the workshop a more healthy atmosphere than the drawing room. There is no reason, save ignorance, why any thing like degradation should attach to the character of the working mechanics. There is no reason, save ignorance, why they should not have dwellings as good as their employers, as to all the purposes of comfort. There is no reason, save ignorance, why they should not have refreshing baths, after their daily toil, and abundant change of comely garments conducive to health. There is no reason, save ignorance, why they should not have abundance of good and well-prepared food for the body, and access to books of all kinds for the proper culture of the mind. There is no reason, save ignorance, why they should not have access to theatres, and operas, and lectures of all kinds, and picture and sculpture galleries, and museums, far more imposing than any thing the world has yet beheld. There is no reason, save ignorance, why the great body of the working people should not possess, in addition to all that is necessary for the comfortable maintenance of the body, all the pleasures of mental refinement, which are now only within the grasp of the very rich. There is no reason, save ignorance, why the ruling power of the state should not be in their own hands, and all else, save only the excitements of ostentation and expensive sensuality." —[Tait's Magazine.]

There is much truth and good sense in the preceding paragraph—enough, indeed, to secure comfort, intelligence, and happiness, to thousands, if they will believe, and *will* it